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How To Fix a Noisy Receiver

RADIO SERVICING METHODS

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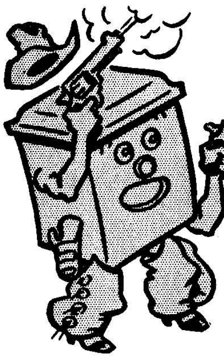


HOW TO FIX A NOISY RECEIVER

WE say a radio is noisy when it makes popping, cracking, sputtering, frying, or rushing sounds. The crashing static heard if you attempt to listen (with an a.m. receiver) to a radio program during or just before a thunderstorm is a good example of noise.

Like hum and oscillation, noise is the result of adding interfering voltages to the signal voltage. Noise may be caused by a defect in the set, but it may also be caused by external interferences—atmospheric conditions, for example, or "man-made" interference resulting from arcing or sparking in electrical equipment.

Since noise may be caused by some external condition over which you have no control, it is not always possible for you to stop the noise. Therefore, the first step in servicing a receiver for noise is to find out if the set is defective or if some outside interference is to blame. Let's see how this is done.

LOCALIZING THE NOISE TO THE SET

Noise impulses can get into the receiver from an outside source through the antenna-ground system or through the power line. Also, if the receiver is in a powerful noise field, the chassis itself (and exposed wiring on it) may pick up noise voltages directly. Therefore, to determine whether the noise is being picked up or is originating within the set, you will have to block these paths to prevent the noise voltage from getting into the set.

Disconnect the Antenna. The first step is to discon-

nect the antenna from the receiver. (If the set has a built-in or loop antenna, follow the directions given later.) With the antenna disconnected, connect a short piece of wire between the antenna and ground posts on the receiver. This effectively prevents noise pickup by the antenna system. If a ground is used on the set, leave it connected temporarily, but connect the antenna itself to the ground, or move it well away from the receiver.

With the volume control turned full on, listen to the receiver. If the noise has decreased greatly or has disappeared altogether, probably the noise source is outside the set.

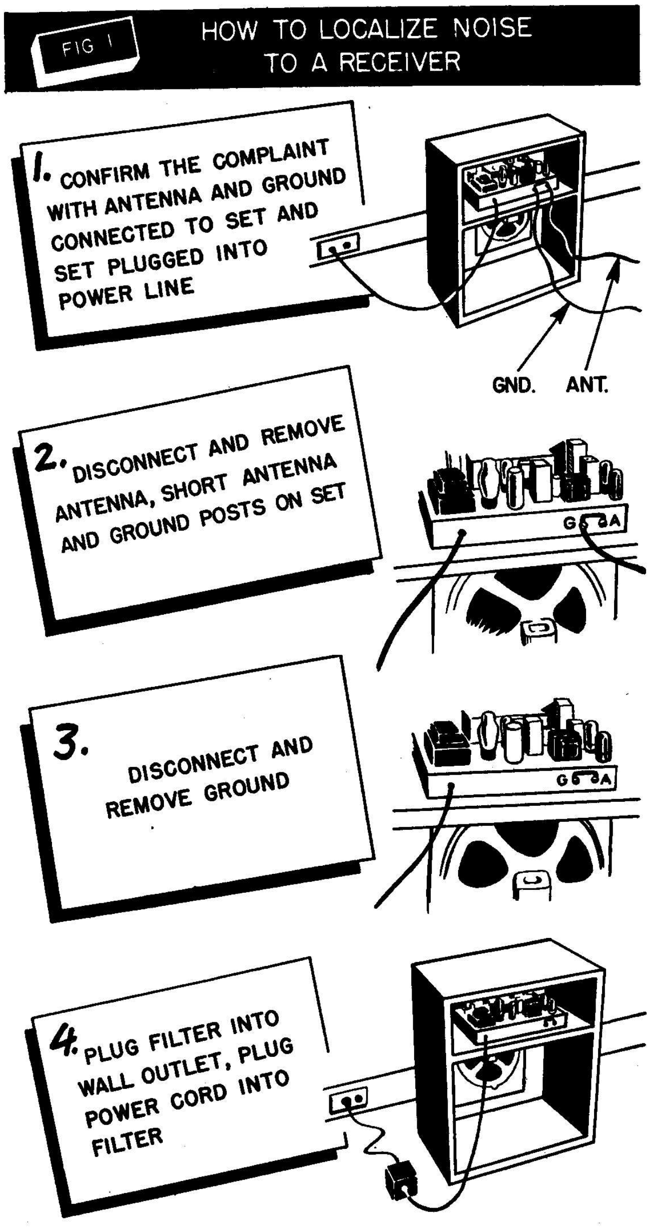
If the receiver has a loop antenna, try rotating the loop (or the entire receiver cabinet). Since loop antennas are rather directional in their receiving characteristics, any change in noise level as you rotate the loop indicates that the set is picking up the noise from some external source.

When a built-in antenna "hank" (a length of wire permanently fastened to the set) is used, roll the wire up so as to reduce its effectiveness as an antenna. If this reduces the noise level, the antenna is picking up the interference.

If the noise is still strong, continue the tests to determine whether the noise is originating in the set, or is coming in over the ground or power line.

Disconnect the Ground Lead. If the noise level remains the same when the ground lead is disconnected, the receiver is at fault, or the noise signal is coming in over the power line. However, if the noise *decreases*, you may have a poor ground. If it *increases*, the noise signal is probably coming in over the power line.

Filter the Power Line. You should have a power line filter — various commercial ones are available — for checking for noise coming over the power line. Fig. *1* shows how the filter is installed: you plug the filter into the wall outlet, and then plug the radio into the filter. This filter, which consists of by-pass condensers and r.f. choke coils, reduces the amount of r.f. energy traveling down the line to the receiver. If the filter reduces the noise, the noise voltage is coming in over the power line.



On the other hand, if the noise remains the same for all these tests, either the receiver is noisy, or it is picking up noise directly because of exposed wiring or because of its location.

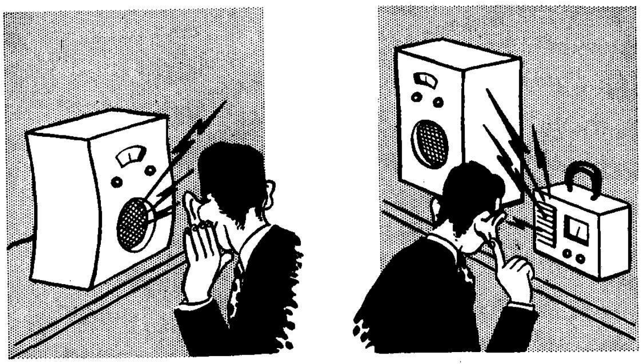
Using a Test Receiver. Sometimes these tests will not be conclusive. If you are not sure whether the receiver is defective or whether the noise is of external origin, you can try another receiver in the same location as the suspected one. A small three-way portable receiver is excellent for this purpose. To make a test with such a portable, proceed as follows:

Turn on the customer's receiver so that the noise can be heard and identified. Then, disconnect the antenna from the customer's receiver, and connect it to the aerial post of the test receiver. Plug the power cord of the test receiver into the outlet, turn on the test set, and tune it to see if the same noise is picked up. If the noise is heard on the customer's receiver but not on the test receiver, the customer's set is probably defective. If noise is heard on *both* receivers, the noise is probably being picked up.

If the noise is apparently being picked up, try the test receiver on its built-in battery supply, unplugging its cord from the wall outlet. If the noise disappears, it was coming in over the power line. If it is still present, it is being picked up by the antenna. In the latter case, disconnect the antenna from the test receiver. If the noise decreases greatly, it is definitely being picked up by the antenna.

► If you have no test receiver, you can take the customer's set to your shop. If the set is noisy in this new location, it is probably defective. On the other hand, if the set plays normally and quietly on your work bench, but is noisy in the home of the customer, then the noise signal is being picked up.

Procedure for External Noises. When you find that the noise originates outside the set itself, the exact procedure to take will depend upon just what you think is causing the noise. If the trouble is atmospheric disturbances, explain to the customer that the noise will go away as soon as any nearby thunderstorms clear up. (Incidentally, f.m. receivers have very little trouble with



To learn whether the installation is responsible for noise, compare the performance of the customer's set with that of your test receiver in the customer's home. Use the same antenna and power outlet for both sets.

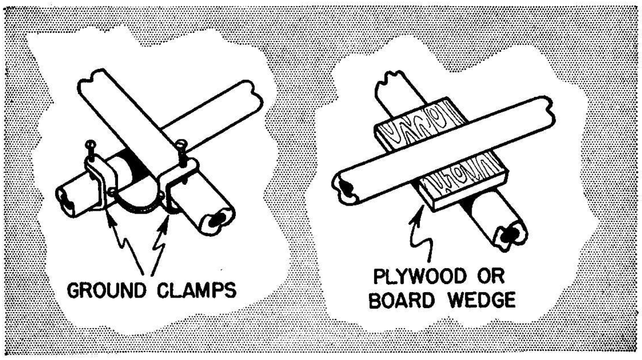
atmospherics, but they do pick up interference from automobile ignition systems and other man-made sources.)

Man-made interference arises from poor contacts in heating pads, arcing between sections of neon signs, sparking commutators on motors, sparking at switches, etc. It can be removed only by installing special filters on the offending device. However, man-made interference is too broad a subject to be covered here. We shall limit ourselves in this RSM Booklet to a discussion of defects within the receiver or associated with the receiver installation.

INSTALLATION DEFECTS

Once you discover that the noise voltage originates outside the set, examine the installation carefully, because a defective antenna or ground system or a loose connection at the wall outlet may be the source of noise.

For example, if the noise disappears when the antenna is disconnected, reconnect the antenna lead-in to the receiver, and then shake the lead-in both near the receiver and outside the home to see if this causes the noise to appear and disappear. If the noise varies as the antenna lead-in is moved, there is probably a broken connection or another defect in the antenna system; go over it carefully.



To prevent interference caused by ground pipes that make variable contact with each other, either bond them electrically (left) or wedge them apart permanently (right).

► Similarly, shake the ground wire. Many people wrap the ground wire loosely around a radiator pipe. After a time, corrosion will set in between the wire and the pipe, or the wire may oxidize because of the heat. Either condition will partially insulate the wire from the pipe; then any movement of the wire may make and break contact between them, and cause noise.

If you find such conditions, see if it is possible to connect the ground wire to a cold-water pipe. Also, use a ground clamp to make good contact between the ground wire and the pipe to which it is connected.

Sometimes the noise is caused by a poor joint in the heating system. Kick the pipe leading to the radiator to which the ground wire is connected. If this causes noise, but a good connection is maintained between the ground wire and the pipe, there is probably a poor electrical contact somewhere in the pipe. Plumbers use a paint or dope in the joints between pipes to seal them and prevent the escape of water and steam. This seal prevents a good electrical contact, and as corrosion develops and joints loosen, the contact becomes poorer.

► Sometimes the noise will occur or increase when you move about the room near the radio. Once in a while this means the receiver is defective, and you are jarring it enough to set the noise off. However, it often indicates that the pipes in the plumbing system under the flooring

are barely touching each other and are making and breaking contact as you move about. This changes the effectiveness of the grounding system and will cause noise. The remedy is to locate the pipes, and then either use two ground clamps and a piece of wire to make permanent connections between the pipes, or separate them permanently by placing a wooden wedge between them.

► Shake the power cord going to the receiver, also, because a poor contact can develop at the wall outlet—particularly if cube taps are used to allow a number of devices to operate from the same outlet. These taps rarely make good contact and can cause considerable noise to develop. If you suspect this, disconnect everything from the wall outlet except the radio. Plug it in carefully; if necessary, bend the prongs on the radio plug to make a better contact. If the junction is still poor, the wall outlet itself may be worn and in need of replacement; try plugging the radio into another outlet to see if the noise disappears.

WHAT CAUSES NOISE IN A SET

Noise is produced by a voltage pulse of irregular wave form. When a noise voltage gets into a signal circuit, it is amplified and passed on just like any other signal. A single noise pulse causes the loudspeaker to emit a single thud, bang, or click; when the noise pulses are close together, a continuous noise results.

Unlike hum, a noise voltage will pass through r.f. stages without being modulated on a station carrier. In other words, noise may enter the r.f. section though the receiver is not tuned to a station. This is possible because the noise pulse has sufficient energy to shock-excite a tuned circuit and cause it to oscillate at its resonant frequency, thus generating a small r.f. pulse that will carry the entire noise pulse with it through the stage.

These sudden voltage surges (noise pulses) are usually caused by a poor connection. For example, a poorly soldered joint in the plate supply lead of some tube may open intermittently. Each time it opens, the plate current will drop suddenly, and a noise pulse will be produced; each time it closes again, the current will rise

sharply, and another noise pulse will be created. A steady noise will be heard if the intermittent open recurs rapidly.

Notice—an open must be *intermittent* to cause noise. A permanent open circuit will result in a dead receiver or in improper operation, depending on the circuit in which the open exists.

Noise is also caused by a poor connection where no connection is desired. A partial short circuit is an example. Suppose that the support of a screen grid becomes loose, allowing the screen to move when the tube is jarred. A sound wave from the loudspeaker may cause the chassis and the tube to vibrate. If the screen grid touches the suppressor grid, the B supply will be shorted; a noise pulse will be set up because the plate current will at once drop to zero. Another mechanical shock may break the connection between the screen and suppressor grids, setting up another noise signal as the contact is opened.

SPECIFIC DEFECTS THAT CAUSE NOISE

Now that you know how a noise signal is generated, let's learn which radio parts cause the complaint. As we discuss each part, we shall describe the tests to use on it, and tell you how to cure the trouble. Hence, when you have localized the trouble to a stage (by methods we will describe later), you should follow the suggestions given for each part.

Variable Resistors. Volume and tone controls are the most frequent cause of noise. They come in two types, wire-wound and carbon, and, with use, both types develop poor contacts between the resistor elements and the sliding contact.

If you hear noise when you adjust a volume or tone control, you can be sure the control is defective. A very bad control will cause noise whether the control is adjusted or not, but the noise will be worse as the control arm is moved.

Once a control goes bad, the best thing to do is to replace it. Any repair you might make would be temporary at best—and would probably take longer than installing a new control.

► A carbon control should not be used in a circuit where d.c. current flows; the current produces sparking where the contact arm touches the resistance strip, burning the strip and causing it to wear out rapidly. Even so, you will frequently find a carbon control used as a diode load as in Fig. *2A*. When you replace such a control, you can lengthen the life of the new control considerably by isolating it from d.c. as shown in Fig. *2B*. The only change involved is the use of a resistor R_A as the diode load, and the use of C_A as a coupling condenser to the control. The resistance of resistor R_A should be between 50,000 ohms and 250,000 ohms, and as near to the resistance of the original volume control as possible within this range. The new control should have the same taper as the original and should be about 500,000 ohms. The condenser C_A can be from .05 mfd. to .1 mfd.

Wire-Wound Resistors. Wire-wound resistors are apt to cause noise, especially in older sets. (They are not widely used in modern receivers.) If pulling on wires going to the taps of a wire-wound resistor causes noise, you can be sure the resistor is defective. If the resistor is a Candohm type (a wire-wound resistor enclosed in a metal can) riveted to the chassis, you can test it by

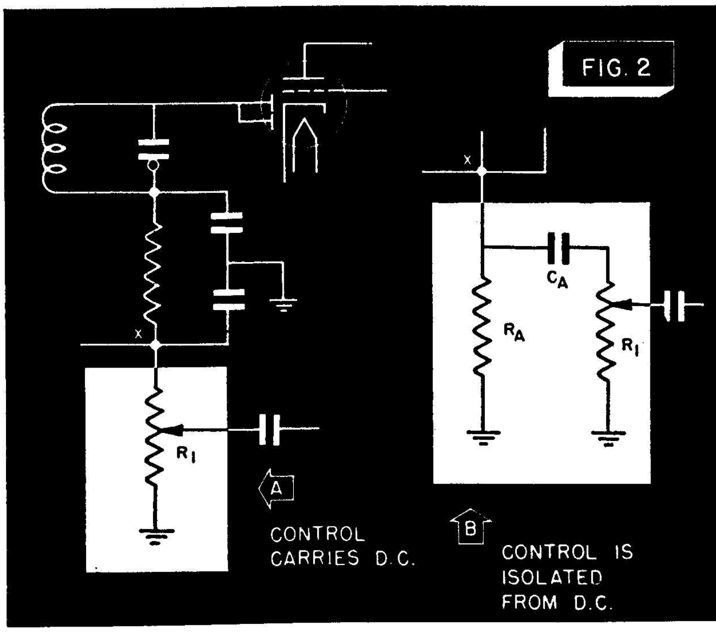


FIG. 2

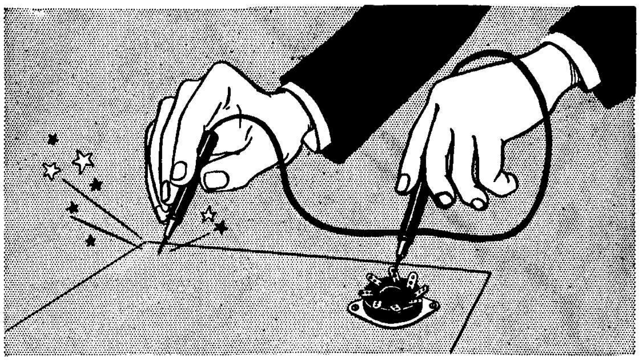
springing out the resistor unit enough to subject it to a mechanical strain. (Insert a screwdriver blade between the resistor can and the chassis, and twist it to cause this strain.) If this causes a sudden appearance or disappearance of the noise, the unit is defective. A defective wire-wound resistor of any type should be replaced.

Transformers. We shall discuss several kinds of transformers in this section, because the same methods of localization and cure are used for each.

Noise originating in a transformer is normally caused by electrolysis (electro-chemical corrosion) at a soldered joint or terminal of the transformer (sometimes, also, between layers of windings). This corrosion will eat through the fine wire of the transformer and thus break the connection. However, the ends of the wire are so close together that arcing occurs across the break. Thus, the circuit is intermittently and rapidly opened and closed, producing sharp changes in the current. This causes machine-gun-like bursts of noise, often so loud they drown out the program.

This form of electrolysis occurs most commonly in a coil that carries d.c. current. Therefore, you can expect the primary windings of transformers to be more affected by this trouble than the secondaries. It is also more apt to occur in a damp climate; in fact, if you live in such a climate, you may find that transformers are a very common source of your noise complaints. In modern receivers, the i.f. transformer is the one that causes the most trouble. The output audio transformer is next, and the r.f. transformer is third in this respect. It is seldom that noise is caused by a power transformer winding, probably because the wire used is so large that electrolysis cannot readily eat all the way through it.

You can check a suspected transformer with your ohmmeter or voltmeter. An ohmmeter test is not always conclusive, because there is at times only a partial open, or the circuit may be completely rejoined at the moment the ohmmeter is used. If you do not find an open at once, hold the ohmmeter test probes on the winding for a few moments to see if the resistance reading changes. If it does, the transformer is defective.



Use a test lead equipped with prods to short from a tube plate socket to the chassis. It's easier than getting a screwdriver into the restricted space. (For simplicity, we have shown no parts or wires connected to the socket in this illustration.)

Since the primary winding (in a plate circuit) is the one most affected, the noise will occur while the set is in operation and the tube is in the socket, but should disappear when the tube is removed from the socket. As a further test (with the tube removed), measure the plate-to-cathode voltage. The voltmeter draws current through the transformer, and the noise may reappear when the meter is connected. Also, the voltmeter reading will vary erratically if the transformer is defective.

If you can see green corroded spots on the winding, you have definite proof that electrolysis is at work. Either the transformer is defective, or it soon will be.

► As a "kill or cure" procedure on an a.c.-operated receiver using a power transformer, you can short-circuit momentarily from the plate socket terminal to B— with a screwdriver or test lead. This will draw a high current through the primary winding of the suspected transformer. If the transformer winding is weakened, it will usually open permanently, thus indicating that the trouble is here. (A winding in good condition will not be harmed by this test as long as the short circuit is momentary.) It is possible that the ends of the wire at the weak spot may be welded together by the high current. This will clear up the noise; however, take this only as an indication that the transformer is defective.

If you suspect a tube has loose elements, snap it with your finger. A burst of noise from the set indicates your suspicions are probably correct.

Do not consider that the defect has been repaired, because it will recur shortly.

Each of the above tests is for the primary winding. If the trouble is in a secondary winding, then the ohmmeter test can be used. Also, you can momentarily short the B supply through the secondary winding of the transformer by holding a test lead between B+ and the grid end of the transformer. This again may open the transformer, thus indicating the location of the defect.

A defective transformer must usually be replaced. Sometimes, as you learned in an earlier Booklet, it is possible to repair a winding if corrosion has occurred at only one end.

Wave-Band and Push-Button Switches. Dirty and loose switch contacts in signal and voltage supply circuits are prolific sources of noise. You can locate these readily, since you will hear noise when you operate the switch.

Usually, you can clean dirty contacts with a tooth brush dipped in carbon tetrachloride. You can often restore lost tension by bending the contacts with a pair of long-nose pliers. Of course, the receiver must be turned off while you are working on the switch.

If cleaning the contacts and bending the contact fingers does not clear up the trouble, then it will be necessary to replace the switch. However, it is advisable to avoid this if possible, because an exact duplicate switch is not always easy to obtain and may be difficult to install.

Tubes. Loose elements or poor internal contacts are the defects that cause tubes to make noise. You can usually locate a tube with loose elements by snapping it with your finger while the set is turned on. If this makes the noise increase, try another tube in the same socket. If the noise then decreases, the original tube must be defective. However, if the noise continues with a new tube, you probably were jarring some nearby part, or have a defective socket.

A certain amount of hissing and frying noise heard when the set is not tuned to a station may be caused by irregularities in the electron emission in tubes. This is not really a defect, however, because the noise will be swamped by the incoming signal when a station is tuned in.

When you find a noisy tube, be sure you destroy it so that it cannot possibly get back into use and cause trouble again. This is necessary because the tube may still test O.K. in a tube tester.

Tuning Condensers. Dirt between the plates, warping or shifting of the plates, or poor contact to the rotor may cause a tuning condenser to produce noise. Usually the noise will become much worse as the tuning dial is rotated, and the set may be dead over a portion of the low-frequency end of the tuning range.

When you meet this condition, examine the condenser carefully. If the plates all seem to touch, the stator section has probably shifted its position. This can occur only if the stators are held to the insulating strips by screws. To make a repair, loosen all the screws, re-space the stator plates, and tighten the screws firmly.

If only one or two of the plates touch, they are probably bent or warped. Straighten them with a thin-bladed knife, a putty knife, or a spatula.

You can clean out dust and dirt from between the

plates by blowing between them with compressed air or by passing a pipe cleaner (obtained at tobacco stores) between each set of plates in turn.

Poor Contacts. Various other kinds of poor contacts can cause noise. Poorly soldered joints are frequent offenders. Always be sure you do a good soldering job yourself—and examine any noisy receiver for evidence of poor soldering by some other serviceman. If solder appears to be lumped or cracked, pull on the leads, and wiggle parts to see if you can make the noise start or stop. Sometimes you can locate a defective joint by pushing on the joints with a wooden stick. When there is any doubt, resolder the connection.

Watch out for drops of excess solder that hang down from a joint and cause a partial connection to the chassis. Remove any you find.

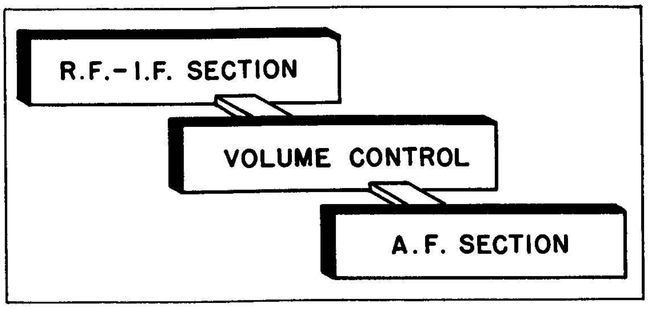
► A poor contact can also exist at a bias cell. These bias cells are held in small holders that depend on spring tension for contact. Sometimes it is necessary to clean the cell or to strengthen the contact.

► Once in a while a shield over a tube or over another part will be a source of noise because it makes a poor contact to the chassis. Normal speaker vibration will shake the shield and thus vary the contact. To improve the contact, tighten the screws holding the shield to the chassis, or bend the shield if it is a pressure fit. If the shield is fastened by rivets, drill them out, and use machine screws, lock washers, and nuts in their places.

Leakage Paths. Sometimes arcing occurs across a dirty or moist bakelite part, producing a charred path of low and varying resistance. Leakage current flowing along this path will also vary, causing noise.

This sometimes happens to tube sockets, particularly those of rectifier tubes. In this case, you will hear a sizzling sound, and, with the lights turned off, you may be able to see the arcing. It is best to replace the socket. Sometimes you can make a repair by scraping away all the carbonized material and painting the spot with speaker cement. This should be considered a temporary repair, however, although it will often last a long time.

Less Common Noise Sources. There are several other



Always remember that the volume control separates the r.f.-i.f. section from the a.f. section in modern sets. This fact lets you locate the defective section very quickly when the complaint is hum or noise. Just turn the volume down—if doing so affects the hum or noise, the complaint is originating in the r.f.-i.f. section.

less common causes of noise. For example, some small receivers use a hank antenna—a flexible wire that is laid on the floor under a rug or around the room. If walking back and forth over it breaks the wire, noise may result because of the intermittent contact.

Wet electrolytic condensers sometimes cause noise because of internal arcing. This trouble is not common today because wet electrolytic condensers are not widely used.

Fixed resistors of the carbon or composition type are rarely at fault unless there has been a complete break. If the resistor element does break, however, an intermittent contact may produce noise.

LOCALIZING THE NOISE SOURCE

Certain clues will lead directly to the noise source. As we have already said, a change in noise level when you operate the wave-band or a push-button switch, the volume control, the tone control, or the tuning condenser, indicates that the device is at fault. Even if you do not have any of these clues, the noise can be localized to a section rather simply. (We are assuming that the noise has been localized to the receiver.)

In the modern receiver, the volume control is either the diode load or is in the input circuit of the first a.f. tube. Therefore, the volume control separates the r.f.-

i.f. section from the audio section. If you turn the volume control to the minimum volume position and the noise disappears, its source is in the r.f.-i.f. section of the receiver; if it remains, its source is in the audio amplifier or in the power pack. (This is not always true —severe changes in current, such as may be caused by a plate circuit defect in an r.f. or i.f. tube, may affect the power supply to the audio amplifier even when the volume control is turned to zero volume. However, in such cases, turning down the volume control will decrease the noise intensity greatly.)

LOCALIZING NOISE TO A STAGE

Noise signals pass through the stages in the same way as other signals do. Their source can be located with a signal tracer, or stage blocking can be used.

To use a signal tracer, tune to some quiet point on the dial. Trace from the first stage of the defective section towards the set loudspeaker. When you first hear the noise coming from the signal tracer speaker, you have located the defective stage.

► Remember that noises caused by defects in common power supply circuits may feed into a number of stages, so it is possible to pick up a noise signal in the plate circuit of one tube when the noise is actually originating in a later stage. This can occur only when the noise signal is unusually strong, or in sets in which there is insufficient by-passing of the supply leads.

Once the defect has been isolated to a stage, check the voltages in that stage to determine which voltage seems to be varying. This may provide an additional clue to the defective circuit.

If you use the stage blocking method, start from the second detector. Work toward the loudspeaker if the trouble is in the audio section, toward the antenna if the trouble is in the r.f.-i.f. section.

When the receiver is a standard a.c. receiver with tube filaments in parallel, it is possible to pull out tubes to block stages. For example in Fig. *3* let's assume first that the noise is in the a.f. amplifier. In this case, you can pull out tube VT_3. If the noise stops, but continues when this tube is in the socket and the volume control

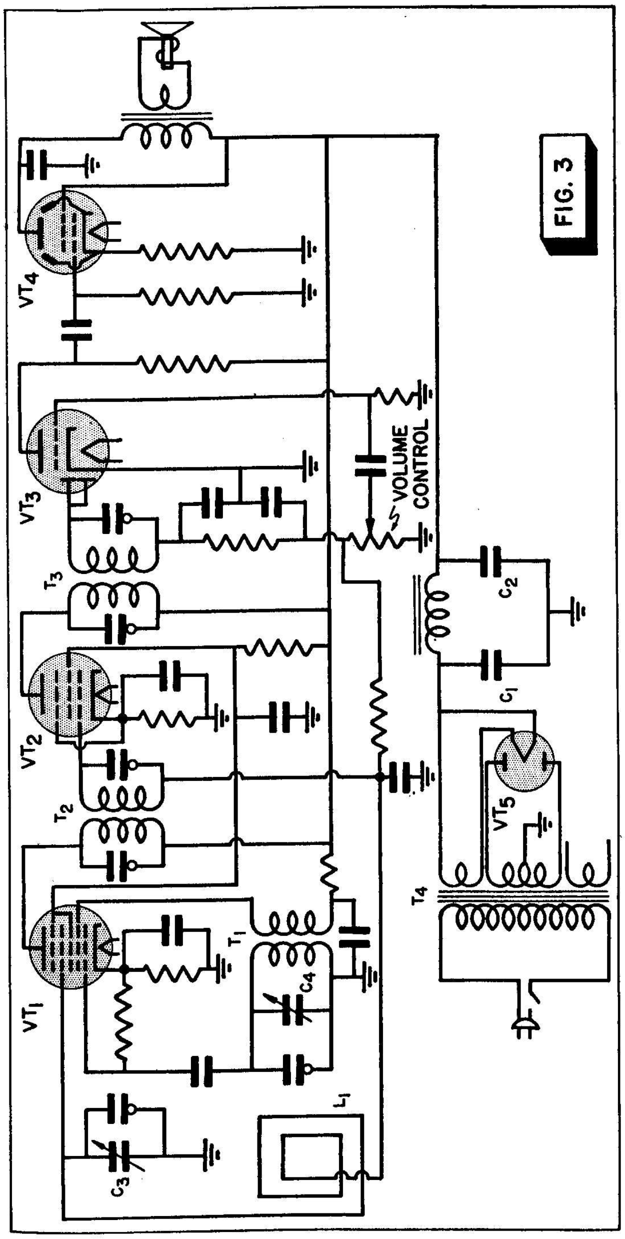


FIG. 3

is turned to minimum volume, it must be originating in the first a.f. circuit. Assuming that the volume control is good, the most likely source of noise in this circuit is the tube itself.

If the noise continues with tube VT_3 out of the socket, it is originating in the output tube stage. Here, a defective output transformer or tube is the most likely cause.

► If, instead, the noise is in the r.f.-i.f. section, turn the volume control to maximum volume and remove tube VT_2. If the noise continues with this tube removed, it must be originating in the diode detector stage; tube VT_3 and the volume control are the most likely suspects.

If the noise stops when VT_2 is removed, replace this tube and pull out VT_1. If the noise continues, it is probably originating in the VT_2 stage. I.F. transformer T_3 and the tube are the most likely source of trouble here.

Of course, if the noise ceases when VT_1 is pulled out, it must be originating in that circuit. I.F. transformer T_2, the tube, the oscillator transformer T_1, the loop antenna L_1, or either of the tuning condensers (C_3 and C_4) could be at fault. Examine each carefully.

To determine whether the noise is in T_2, leave VT_1 out of the socket, and connect a voltmeter between the plate terminal of the VT_1 socket and the chassis. The voltmeter current will then be drawn through the primary of T_2. If the noise occurs now, but does not with the voltmeter disconnected, the primary of T_2 is defective.

► Of course, if the receiver is not a standard a.c. set, you can't pull out the tubes. In this case, block the grid or plate circuits. It is easiest to block grid circuits, and the simplest way to do so is to connect a large by-pass

BENCH HINTS

Many record changers will not work properly if the motor board is not level. Check levelness with a carpenter's or machinist's level resting on the motor board (not on the turntable). If you find the board is not level, slip small cardboard or wood wedges under the cabinet.

condenser (.25 mfd. to .5 mfd.) across the input device. If the chassis is connected to B—, this is rather easy—you can connect the condenser between the control-grid terminal of the tube, and the chassis. Otherwise, you must find B— and perhaps use a test lead to connect one terminal of the condenser to B— while the other end is held to the grid terminal of the tube.

To use this method, first hold the condenser across the grid resistor of the output tube. (Using Fig. *3* as our example, this would be VT_4.) If the noise stops, the trouble is nearer the antenna; if it continues, it must be originating in the output stage.

If the noise stops when the grid of VT_4 is blocked, move back to the grid of VT_3. If the noise now continues, it is originating in VT_3 or in the coupling between VT_3 and VT_4.

You can move through the r.f.-i.f. section of the receiver in a similar manner. Blocking the grid of VT_2 will eliminate any noise originating nearer the antenna, so, if the noise continues, it is arising in the VT_2 plate circuit or in the diode detector circuit.

Since a large condenser is not too good as an r.f. bypass condenser, use a smaller condenser (say .05 mfd.) between the grid of VT_1 and the chassis. If the noise stops, it is originating in the L_1-C_3 circuit. However, if the noise continues, it may be originating either in the plate circuit of VT_1 or in the oscillator circuit. The oscillator circuit can be eliminated by temporarily short-circuiting condenser C_4 with a screwdriver. If this kills the noise, the oscillator circuit is at fault.

► It is possible to block plate circuits by the same method. However, there is always danger of getting a shock. Furthermore, the condenser will charge or discharge each time you use it; in some low-voltage plate circuit, there may be a heavy enough discharge current to weld the defective connection temporarily. This may leave you without a clue to the defective part until the noise returns later. Blocking the grid circuit does not have these disadvantages.

► Almost the only other quick stage localizing test besides stage blocking (when the only test equipment is a

signal generator and a multimeter) is to strike the chassis with your palm. If this intensifies the noise, or changes its volume, try jarring different places about the chassis. Usually one part of the chassis (or a certain tube) will appear more sensitive to jarring than the rest. You should then wiggle leads and pull on parts in the nearby stage or stages. Very frequently this will localize the noise.

THE NRI PRACTICAL EXPERIENCE PLAN

It is not possible to duplicate all the parts defects described in this Booklet on your test receiver. However, this is not important. In servicing a noisy receiver, the real job is in localizing the noise to a stage, and that is what you should learn to do now.

Try to make a poor connection that will cause noise when the receiver is jarred. Hold your soldering iron tip on the plate socket terminal of one tube, and grasp the lead going to this terminal with your pliers. When the solder melts, remove the iron, and wiggle the lead while the solder hardens. This will cause a loose connection. Next turn on the receiver, and when it warms up, jar the chassis with your hand. Noise should result. If it does, proceed to localize the trouble by the procedures we have described. Try this on several tube socket terminals. Be sure to resolder carefully these connections when you have finished.

When you service a receiver—for noise or for any other complaint—try several different localization tests after you have found the defect. For example, you may find a noisy tube almost at once. However, leave the tube in the set and try other localization tests to see how they work out. Do the same for other defects. In this way, you will learn the method that works best for you for each particular kind of difficulty.

COMMON CAUSES OF NOISE

Type of Noise	*When Noticed*	*Parts to Check*
Scratching	**Tuning set**	**Condenser gang**
Scratching	**Adjusting volume or tone control**	**Control adjusted**
Crashing	**Changing wave band**	**Wave band switch**
Steady or intermittent rushing	**Between stations and on weak stations**	**Antenna, antenna coil, mixer tube**
Steady crackling	**Always**	**I.F. or a.f. transformer primary**
Intermittent crackling	**If chassis is jarred**	**Tube or connection**